

Amendment to the Claims

This listing of claims will replace all prior versions, and listings, of claims in this application.

Listing of Claims:

1. (Currently Amended) A process for the enzymatic ~~hydrolysis~~ alcoholysis of oils and/or fats with simultaneous enzymatic formation of fatty acid esters using one or more lipases acting as biocatalysts and alcohols, especially n- and iso-alcohols, said process comprising:

causing the lipases, as biocatalysts for ~~hydrolysis~~ alcoholysis of oil or fat and formation of fatty acid esters in a fat ~~hydrolysis~~ alcoholysis /esterification, to act on a mixture of triglycerides, water, and an alcohol soluble in oil or fat to create a reaction mixture formed in the fat ~~hydrolysis~~ alcoholysis /esterification;

transferring the reaction mixture to a drum of a self-discharging centrifuge for separation into a glycerol-containing aqueous phase and an organic phase that contains the fatty acid esters which have formed;

adjusting the centrifuge so that a lipase-enriched intermediate layer formed in the centrifuge between the aqueous phase that is drained off and the organic phase that is drained off is accumulated in the centrifuge; and

emptying contents of the drum of the centrifuge, the drum contents including the accumulated intermediate layer, at specified times for recycling to the combined ~~hydrolysis~~ alcoholysis and esterification process or are made ready for a further ~~hydrolysis~~ alcoholysis and esterification process.

2. (Currently Amended) The process of Claim 1, wherein the amount of alcohol is used ~~is in~~ an excess of from 2 to 100%, preferably 5% to 20%, based on ~~as compared to the stoichiometric~~ the amount of alcohol stoichiometrically necessary required for complete esterification.

3. (Currently Amended) The process of Claim 1, wherein the amount of water added is at least 5% by weight ~~based upon~~ of the total weight of the organic phase employed that is comprised of oil or fat and alcohol.

4. (Currently Amended) The process of Claim 1, wherein the alcohol used is an alcohol which is quite soluble in the organic phase formed, but is considerably less soluble in water, ~~and especially medium chain to long chain n- and iso- alcohols.~~

5. (Currently Amended) The process of Claim 1, wherein the fat ~~hydrolysis~~ alcoholysis/esterification is carried out discontinuously in reactors that are run in loop operation with the reactor contents circulated by pumps, with multiple reactors being provided in parallel for a single, or for each added, reaction stage, with one of the reactors being filled with the circulating loops not active, with ~~a hydrolysis~~ the alcoholysis/esterification operation being run in a second reactor having active circulating loops, with a third reactor having its circulating loops not active and being emptied through a centrifuge which separates the glycerol-containing aqueous phase formed in the ~~hydrolysis~~ alcoholysis process from the organic phase containing the fatty acid esters prior to when the fatty acid esters are separated from the organic phase.

6. (Currently Amended) The process of Claim 1, wherein the lipases ~~is~~are selected from a group consisting of non-specific lipases, specific lipases, or mixtures of non-specific and specific lipases.

7. (Currently Amended) The process of Claim 1, wherein the free fatty acids and alcohol from the organic phase are separated by distillation from the fatty acid esters that have formed and these separated free fatty acids and alcohol are returned to the ~~hydrolysis~~alcoholysis/esterification process.

8. (Currently Amended) The process of Claim 1, wherein the organic phase drained out from the self-discharging centrifuge is transferred to another self-discharging centrifuge, which is likewise emptied intermittently to recover lipase residues that have collected as a sediment on the centrifuge wall for reuse in the ~~hydrolysis~~alcoholysis process.

9. (Withdrawn) A device for carrying out the process of the enzymatic hydrolysis of oils and/or fats with simultaneous enzymatic formation of fatty acid esters using lipases acting as biocatalysts and alcohols, especially n- and iso-alcoholone, said device comprising:

at least one-hydrolysis/esterification reactor for use in a hydrolysis and esterification process;

at least one self-discharging centrifuges in which a lipase-enriched phase formed in the at least one hydrolysis/esterification reactor between an aqueous phase that is drained off and an organic phase that is drained off, accumulates in a drum of the at least one centrifuge which is emptied at specified times;

a feedback system for returning contents of the intermittently emptied drum including

said lipase-enriched phase from the at least one centrifuge to the combined hydrolysis and esterification process; and

a means for separating alcohol, free fatty acids and fatty acid esters formed from the organic phase that is supplied from the at least one centrifuge.

10. (Withdrawn) The device of Claim 9, wherein the means for separation is a distillation apparatus.

11. (Currently Amended) A process for the enzymatic ~~hydrolysis~~ alcoholysis of oils and/or fats using lipases acting as biocatalysts to obtain fatty acid[[s]] esters and glycerol, said process comprising:

causing lipases to act as biocatalysts on a mixture of an oil or fat and water to ~~hydrolyze~~ alcoholize the oil or fat to produce a reaction mixture;

transferring the reaction mixture thus produced to a self-emptying centrifuge for separation into a glycerol-containing aqueous phase and an organic phase that contains ~~free~~ fatty acid[[s]] esters that have been ~~hydrolyzed~~ alcoholized off in the preceding ~~hydrolysis~~ alcoholysis;

adjusting the centrifuge so as to accumulate a lipase-enriched intermediate phase that forms in the centrifuge between the aqueous phase that is drained off and organic phase that is drained off; and

emptying the centrifuge of drum contents at specified times and the centrifuge drum contents that have been emptied from the centrifuge are returned to the ~~hydrolysis~~ alcoholysis process or are prepared for a further ~~hydrolysis~~ alcoholysis process.

12. (Currently Amended) The process of Claim 11, wherein the fat ~~hydrolysis~~ alcoholysis is carried out discontinuously in reactors that are run in loop operation with the reactor contents circulated by pumps, with multiple reactors provided in parallel for a single or for each of numerous reaction stages, with one of the reactors being filled with the circulation loops not active, with a ~~hydrolysis~~ alcoholysis operation being run in a second reactor having active circulation loops, with a third reactor having its circulating loops not active and being emptied through a centrifuge which separates the glycerol-containing aqueous phase ~~formed in the hydrolysis process~~ from the organic phase containing the free fatty acid[[s]] esters prior to when the fatty acid[[s]] esters are separated from the organic phase.

13. (Currently Amended) The process of Claim 11, wherein ~~the~~ free fatty acids and alcohol are separated by distillation out of the organic phase from the fatty acid esters that have formed, and are returned to the ~~hydrolysis~~ alcoholysis /esterification process.

14. (Currently Amended) The process of Claim 11, wherein the organic phase flowing out of the self-discharging centrifuge is transferred to another self-discharging centrifuge, which is likewise emptied intermittently to recover residues of lipase that have collected as a sediment on the centrifuge wall for reuse in the ~~hydrolysis~~ alcoholysis process.

15. (Withdrawn) A device for carrying out the process for the enzymatic hydrolysis of oils and/or fats using lipases acting as biocatalysts to obtain fatty acids and glycerolany, said device comprising:

at least one hydrolysis reactor for use in a hydrolysis process to form a reaction mixture;

at least one self-discharging centrifuges in which the reaction mixture is separated into an aqueous phase that is drained off and an organic phase that is drained off, wherein a lipase-enriched intermediate layer being formed between said aqueous phase and organic phase is accumulated in the centrifuge, and which is emptied at specified times;

a feedback system for transporting contents of the intermittently emptied at least one centrifuge including the intermediate layer from the centrifuge to the hydrolysis process; and

a means for separating free fatty acids from the organic phase that is supplied from the centrifuge.

16. (Withdrawn) The device of Claim 15, wherein the means for separation is a distillation apparatus.

17. (Withdrawn) The device of Claim 16, wherein said distillation apparatus is selected from a group consisting of a short-path still and a falling film evaporator.

18. (Withdrawn) The device of Claim 10, wherein said distillation apparatus is selected from a group consisting of a short-path still and a falling film evaporator.

19. (Previously Presented) The process of Claim 14, wherein the another self-discharging centrifuge is a polishing centrifuge.

20. (Previously Presented) The process of Claim 8, wherein the another self-discharging centrifuge is a polishing centrifuge.

21. (New) The process of Claim 2, wherein the excess amount of alcohol used as compared to the amount of alcohol stoichiometrically necessary for complete esterification is between 5% and 20% excess.

22. (New) The process of claim 4, wherein the alcohol is selected from a medium-chain to long-chain n- or iso-alcohol.